KLAUS J. BACH & ASSOCIATES
PATENTS AND TRADEMARKS
4407 TWIN OAKS DR
MURRYSVILLE, PA 15668 USA
TEL: 724-327-0664
FAX: 724-327-0004

OFFICIAL

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Examiner: Moore, Karla A. Docket: SACHER II-Div

Applicant(s): Dr. Joachim Sacher et al.

RECEIVED CENTRAL FAX CENTER OCT 02 2003

Serial No.: 09/902,882 In Response To Paper No: 17

Filing Date: 12/July/01 Art Unit: 1763

Title: COATING PROCESS AND APPARATUS

#18 10/7/03 [illegible]

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

October 1, 2003

SIR:

This is in response to the Official Action dated 07/03/03.

The present application includes claims 14 to 20.

The Examiner has rejected claims 14 – 16 and 18 – 20 under 35 USC 103(a) as being unpatentable over US 6 037 006 to Chakrabarti et al. (1) in view of US 5 221 636 to Landreau et al. (2) in view of Jap. Patent No. 61 204373A to Kawarada et al. (3) and she has rejected claim 17 under 35 USC 103(a) as being unpatentable over Chakrabarti et al., Landreau et al. and Kawarada et al. as applied to claims 14 – 16 and 18 – 20 and further in view of US 5 980 975 to Nomura et al. (4).

(1) Chakrabarti et al. (US 6 037 006) discloses a method and fixture for the coating of the facets of diode laser bars. The apparatus comprises a vacuum chamber 160 in which an electron beam source 168 is disposed for vaporizing coating material. A rotatable structure 164 is supported at the top of the chamber and carries a number of fixtures 150 supporting diode laser bars 90, which are engaged between web slats 50-1 to 50-n. The web slats are spring-biased toward each other and hold the diode laser bars therebetween while protecting their side surfaces from being coated. The fixtures 20 may be rotated for coating the front facets 100 and the rear facets 102 of the diode laser bars 20.

The vapor source 170 is arranged at a side of the vacuum chamber so that, by rotating the rotatable structure 164 successively one fixture after the other can be exposed to the coating vapor 176 for the facet coating of the laser bars supported on the fixtures.

The purpose of this apparatus is to provide a cost-effective method of facet-coating for diode laser bars for the passivation of the laser facets or directing the coating particle beam to one facet of the lasers. A high quality anti-reflection coating, which must have an accurately controlled thickness for each individual laser cannot be provided by this method.

2) Landreau et al. (US 5 221 636) discloses a process and apparatus for the deposition of an anti-reflection coating on the facets of an optical amplifier (laser). A particular laser is subjected to the coating procedure until the coating has reached the desired thickness which is determined by monitoring the voltage. The two facets of a laser are alternately treated so that the coating is applied essentially simultaneously and symmetrically. The thickness of the coating is measured by applying a current to the optical amplifier being treated and shutting down the coating procedure when the voltage across the optical amplifier passes through a maximum which indicates that an overall reflectivity minimum has been reached.

3) Kawarada et al. (JP 61 204373) discloses an apparatus and method of providing substrates with coatings of different thicknesses in a single coating procedure.

Kawarada et al. explains that in a coating procedure, wherein all the substrates are subjected at the same time to the vapor deposition process, the substrates will all have essentially the same coating thickness. Kawarada et al. therefore provides shutters for individually covering selected substrates after a certain exposure to the coating process while others con-

tinue with the deposition procedure so that substrates with different coating thicknesses can be obtained in a single vapor deposition procedure.

4) Nomura et al. (US 5 980 975) discloses a method and apparatus for manufacturing large thin-film coated substrates such as antireflection filters by measuring the coating formation on the substrate using a film formation monitor or monitors placed outside the film formation area and measuring the thickness of the coating on the monitors and controlling the film coating process based on the measured thickness of the coating deposited on the monitor.

The present invention resides in an apparatus for coating the facets of semiconductor laser diodes with an antireflection layer of minimal reflectivity. Means are provided for monitoring, in situ, at least one of the laser parameters of each laser. A receiver is provided for containing the lasers to be coated which lasers are supported in the receiver on a support structure such that their facets are all disposed at essentially the same distance from a coating source and, for each laser, a shutter support structure is disposed in the receiver with a shutter supported on each support structure so as to be movable selectively and individually in front of the laser to protect a particular laser from further coating when the laser parameters as determined by the monitoring means indicate that an optimum coating stage has been reached for that particular laser.

In short: When the monitoring means by which the lasers which are all subjected to the same coating process indicates that one of the individually monitored lasers has reached optimum coating thickness, its individually operable shutter is activated to cover the particular laser and prevent further coating.

The concept of providing means for individually monitoring a plurality of lasers which are all coated at the same time and providing means for covering each laser individually when its monitoring means indicates that the optimum coating thickness has been reached, so that for each laser in the common coating procedure the optimum coating thickness can be achieved, is not disclosed in any of the references cited by the Examiner.

It is noted that, with the apparatus according to the invention, a relatively large number of lasers can be coated concurrently with few, if any, rejects since all lasers are individu-

ally monitored and the coating procedure as terminated for each individual laser at the appropriate time while the coating process can continue until all the lasers are properly coated.

The Examiner's rejections:

The rejection of claims 14 -16 and 18 – 20 under 35 USC 103(a) as being unpatentable over US 6 037 006 to Chakrabarti et al. in view of US 5 221 636 to Landreau et al. in view of Jap. Patent No 61 204373A. A copy is enclosed herewith.

As to the suggested combination of Landreau et al. with Chakrabarti et al., it is noted that, with the method of Landreau et al., the thickness of the coating of the diode laser is measured indirectly by monitoring the change of the voltage across the diode laser. The deposition process is interrupted when the voltage reaches a maximum. Only a single laser diode is treated at a time as the coating process has to be monitored.

Chakrabarti et al. shows a mounting arrangement for a plurality of laser bars for coating the laser bars all at one time.

It is not clear how the Examiner suggest these two references could be combined to arrive at an arrangement where a plurality of lasers could be treated at the same time and the treatment process of all the individual laser bars mounted on the fixtures 150 supported on the rotating assembly 164 could be individually monitored. This is certainly not possible without any inventive contribution if it is possible at all.

Besides the method proposed by Landreau et al. for monitoring the thickness of the coating of the facet of a diode laser is not considered to be practicable. Landreau et al. proposes to monitor the change of the voltage across the diode laser. The coating procedure is interrupted when the voltage reaches a maximum.

This method results in a systematic error since it does not take into consideration the wavelength change of the laser emission during the deposition process. Deposition of an antireflection coating on the facet of a diode laser results in a lower quality of the laser cavity, which results in a lower emission wavelength – see Http://data.sacher.us/techdocs/wavelength.pdf.

Interrupting the deposition process as suggested by Landreau et al. results in an antireflection coating which is optimized for typically 50nm – 100nm below the operation wavelength of the diode laser within an external cavity. For quality requirements, see: Http://data.sacher.us/techdocs/classes.pdf.

The method of Landreau et al is therefore not suitable for diode lasers which are supported to be operated within an external cavity so that the process described by Landreau et al. is actually not a process usable in connection with the present invention and would not be considered for combination with Chakrabarti et al. – already for that reason.

Concerning the Examiner's suggestion to combine the Kawarada et al. with Landreau et al., it is noted that, as pointed out earlier, Kawarada et al. relates to a process and apparatus for applying to a plurality of substrates or surfaces coatings of different thicknesses and doing that in a single coating procedure. What kind of coating is used is not disclosed therein and it is not said therein how the coating thickness is measured or whether it is measured at all. It must therefore be assumed that the shutters are simply activated to interrupt the coating process for certain of the substrates or surfaces after different exposure times in order to obtain different coating thicknesses.

Certainly such an apparatus would not lead itself to a combination with laser facet coating apparatus where not different coating thicknesses are to be formed, but rather an optimum coating for each particular laser facet must be produced.

In summary, it is asserted that an apparatus for coating a single laser while maintaining the coating thickness (wherein the procedure described does not provide optimum results), an apparatus for coating a plurality of laser bar facets at the same time, and an apparatus for providing surfaces in one coating step with coatings of different thicknesses will not lead to the laser coating apparatus as defined in claim 14 of the present application.

In this connection, it has been decided that:

" Contrary to the position taken by the Examiner in determining the patentability of an invention, it should be recognized that the fact that the prior art could be modified in an Examiner's view so as to result in the combination defined by the claims at bar would not have made the modification obvious unless the prior art suggests the desirability of the modification." See In re Deminski, 796 F.2d 436, 230 USPQ 313 (Fed. Cir. 1986).

Furthermore, In re Laskowski, CAFC, No. 88-1349, decided April 3, 1989, concerning an invention utilizing, for the support of a saw band, a loose tire rather than a tightly fitted tire, the Court stated that, although the Commissioner suggests that Hoffman (the cited prior art utilizing a tightly fitted tire) could readily be modified to form the Laskowski structure (with loosely fitted tire), the mere fact that the prior art could be so modified would not have made the modification obvious unless the prior art suggested the desirability of the modification.

Certainly, there is no hint in the references which would suggest a combination of the references as alleged by the Examiner.

Reconsideration of the Examiner's rejection of claim 14 under 35 USC 103 is therefore respectfully requested.

Claims 15 – 17 relate to particular support arrangements for the laser diodes in the receiver which provide for relatively uniform vapor deposition on the laser diode facets and claims 18 to 20 relate to various laser parameter monitoring and deposition control arrangements.

All these claims are directly or indirectly dependent on claim 14 and consequently include all the features of claim 14. They should therefore be patentable together with claim 14 already for that reason.

Reconsideration of claims 15 – 20 and allowance of claims 14 – 20 is solicited.

Respectfully submitted,

K. Bach

Klaus J. Bach, Reg. No. 26832

RECEIVED
CENTRAL FAX CENTER
OCT 0 2 2003
OFFICIAL